NREL in Focus

First Director Joins National Bioenergy Center

DOE's National Bioenergy Center, based at NREL, welcomed Dr. Michael Pacheco as its first director in 2003. Pacheco arrived with an impressive resume from private industry, most recently with Louisiana-Pacific Corp., for which he was manager of oriented strand board technology and product quality. He also spent two years as a corporate engineering fellow with the company.

Dr. Michael Pacheco becomes director of the National Bioenergy Center.

Pacheco has led efforts to commercialize biocatalytic processes with Texas-based Energy BioSystems Corp., where he was vice president of process development. He held numerous supervisory R&D positions during 13 years with Amoco Corp. and three years with Conoco Oil Co. Pacheco holds a Ph.D. in chemical engineering from the University of California at Berkeley, a bachelor of science in chemical engineering from Clarkson University, and an associate degree in chemical technology from Thames Valley College.

Pacheco will provide strategic guidance, technical direction, and management to continue the center's leadership role in bioenergy research. His responsibilities include coordinating NREL's activities with bioenergy research at Argonne National Laboratory, Idaho National Energy and Environmental Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory. Pacheco will represent the interests of DOE, NREL, and the other labs to technical and industrial leaders and to various U.S. and international stakeholders.

The Bioenergy Center was created in 2000 as the focal point for developing bioenergy technology and information in the United States. It gives industry "one-stop shopping" for world-class research and state-of-the-art laboratory facilities at several federal agencies. As the center's new director, Pacheco replaces acting director, Stan Bull, who is NREL's Associate Director for Science and Technology.

The center links DOE-funded biomass renewable energy research programs with the resources and capabilities of the U.S. departments of Agriculture and Interior, the Environmental Protection Agency, the National Science Foundation and several other federal agencies, DOE laboratories, universities, and the private sector. NREL's biomass research program focuses on converting biomass feedstocks into transportation fuels, chemicals, biobased materials, and electric power.

Seibert Named Research Fellow

In October of 2003, internationally recognized research scientist Michael Seibert was named as the newest member of NREL's Research Fellows Council. An NREL employee since 1977, Seibert has devoted his career to researching structure and function problems in photosynthetic energy capture, biological water-splitting processes, and photoproduction of hydrogen by algae.

Before becoming an NREL research fellow, Seibert was elected a fellow of the American Association for the Advancement of Science. He currently serves on the editorial boards of *Advances in Solar Energy*, *Applied Biochemistry and Biotechnology*, and the *American Institute of Physics International Series in Basic and Applied Biological Physics*. Seibert has established scientific and technical collaborations throughout the world; authored more than 170 scientific articles and reviews; and given more than 150 conference presentations. He holds eight U.S. and foreign patents.

Seibert holds a Ph.D. in molecular biology and biophysics, and an M.S. in physics, both from the University of Pennsylvania; and a B.S. in physics from Pennsylvania State University. He was born in Lima, Peru and grew up near Philadelphia.

The Research Fellow and Senior Research Fellow positions at NREL were established to provide parallel or dual career opportunities for outstanding scientists and engineers who have achieved exceptional positions of leadership in their fields, but who wish to devote the majority of their time and energy to scientific and technological endeavors. Candidates are nominated by senior management and current research fellows. Seibert joins Art Nozik, Alex Zunger, Tim Coutts, Dick Ahrenkiel, and Ralph Overend on the NREL Research Fellows Council.

Dr. Michael Seibert is named to NREL's Research Fellows Council.

S&TF Plans Move Ahead

NREL's much-needed Science and Technology Facility (S&TF) took a big step closer to becoming reality in November 2003, with $4 million in funding for its first phase of construction approved in the Energy and Water Development Appropriations Act of 2004. Construction is expected to begin in the late summer of 2004 and be completed in approximately two years.

Construction of the proposed semiconductor research facility is estimated to cost a total of $20.2 million. It will be located 80 feet to the east of the existing Solar Energy Research Facility (SERF) and will include 71,000 square feet of laboratory, office, and support space on three levels. The building will be connected to the SERF via an elevated bridge that links the service corridors of the two buildings, thereby facilitating collaboration between researchers in the two facilities. Approximately 75 research staff will work in the new facility.

The facility-design process — completed on time and within budget — was no small feat, says Pete Sheldon, a division manager who represented the National Center for Photovoltaics in designing the facility. The process solicited input from an NREL team of experienced researchers, chosen to ensure that current and future research requirements will be met. The team also included representatives with expertise in energy-efficient building design, daylighting, sustainability, and environmental health and safety.

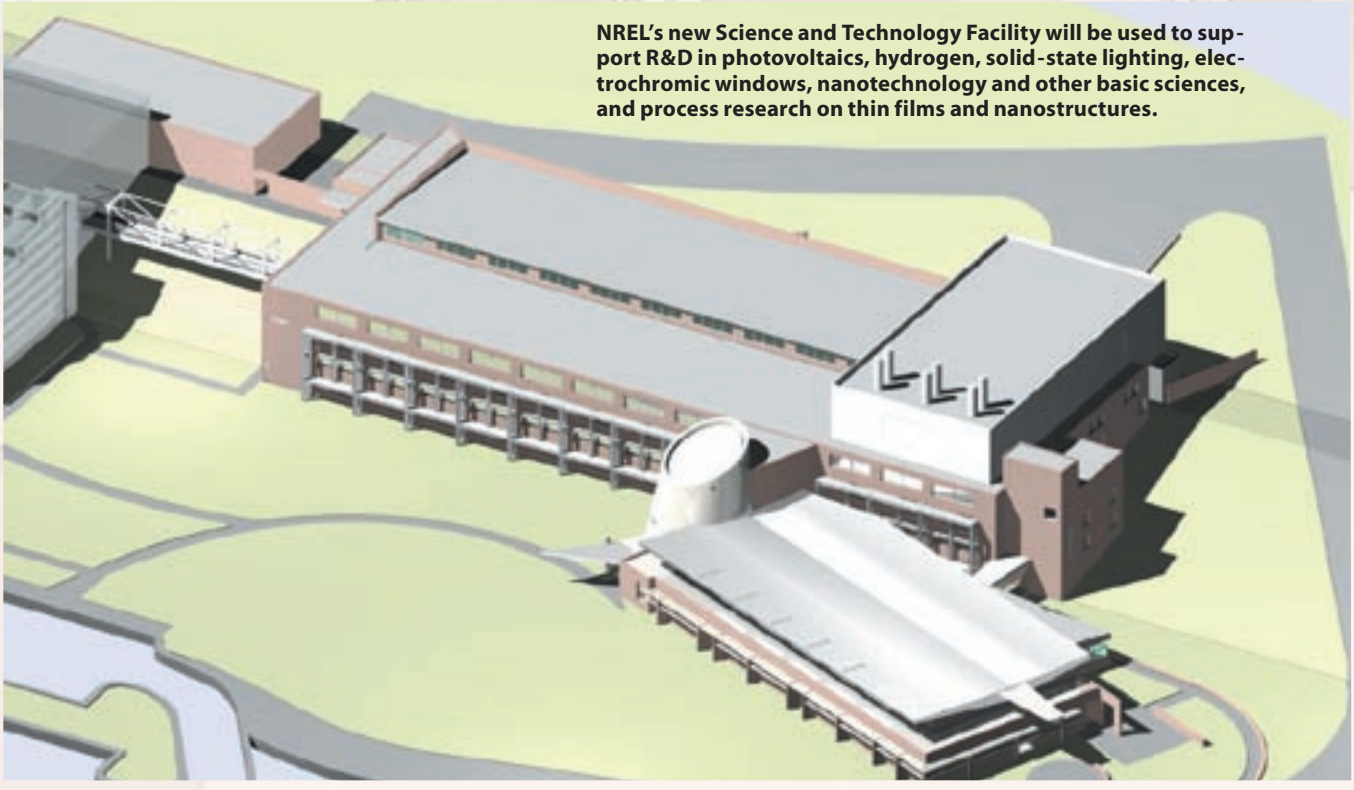
Research capabilities within the new S&TF, combined with those of the existing SERF, will enable new and expanded work in photovoltaics, hydrogen, solid-state lighting, electrochromic windows, and basic sciences, including nanotechnologies.

The S&TF will support process research on thin films and nanostructures for DOE and for U.S. companies developing energy technologies. It is designed around a process research concept specifically developed to accelerate the time required to transfer research developed in the laboratory to manufacturing and use, Sheldon says. The centerpiece of the building is the Process Development and Integration Laboratory — an open 11,000-square-foot lab space specifically designed to accommodate a new class of thin-film deposition, processing, and characterization tools. These tools will provide new ways to bridge the gap between laboratory and commercial success, by allowing researchers to flexibly prototype processes in a controlled environment.

The facility was designed with sustainability in mind. The multi-story design reduces the building footprint to approximately 45,000 square feet, thereby conserving valuable land for future expansion opportunities. It exploits a state-of-the-art energy efficient mechanical design that reduces energy use by 50%, compared with a DOE 10CFR434 compliant building. And it will provide 100% of the ambient light requirements in the open office and circulation areas, while maximizing daylighting opportunities in the laboratories.

Lab Takes on Hydrogen Systems Integration

With the nation's high expectations for hydrogen as an important energy carrier comes a new, high-profile responsibility for NREL. The Laboratory was designated the central systems integrator for DOE's hydrogen efforts as of March 2003.



NREL's new Science and Technology Facility will be used to support R&D in photovoltaics, hydrogen, solid-state lighting, electrochromic windows, nanotechnology and other basic sciences, and process research on thin films and nanostructures.

The role includes documenting technical requirements of a future hydrogen energy system for the United States, and linking these requirements to DOE's programs. It also covers independent analysis, developing and maintaining an integrated baseline, hydrogen infrastructure modeling and simulation, configuration control and management, integrating scheduling, budgets, scope of work, and other important areas.

NREL supports the President's Hydrogen Fuel Initiative in many ways, some new and some long-standing. It performs basic research and development in numerous hydrogen areas, verifies the performance of hydrogen technologies in development, validates emerging technologies, and helps establish codes and standards for hydrogen safety.

The Laboratory leads nationwide R&D efforts in:

- production of hydrogen from renewable energy sources;
- delivery and storage of hydrogen in a national infrastructure;
- uses of hydrogen in fuel cells, both in stationary and transportation applications; and
- validation of emerging technologies.

Dale A. Gardner joined NREL on December 1, 2003 to direct the Laboratory's hydrogen systems integration work for the U.S. Department of Energy. The work he leads will directly inform Steve Chalk, manager of DOE's Hydrogen, Fuel Cells and Infrastructure Program.

Dale Gardner directs the Laboratory's hydrogen systems integration work for the DOE.

Gardner came to NREL from Northrop Grumman Mission Systems, where he managed the company's operations in Colorado Springs, Colorado. He has more than 30 years of experience with industry, NASA, and the military in systems management, design, development, and integration. He began his career with the Navy and the Naval Air Test Center and flew on two space shuttle missions as a mission specialist. Gardner supervised implementation of a worldwide space-sensor network at U.S. Space Command in Colorado Springs before managing engineering support programs for TRW, Inc. and Northrop Grumman Corp.

Dr. Steven Hammond directs NREL's Computational Sciences Center.

Computational Sciences Center Aids R&D

Along with theory and experiment, computation is considered an equal and indispensable partner in advancing scientific knowledge and engineering practices. Enormous computational capacity is needed to study the details of complex systems at ever-higher levels of detail and realism.

Recognizing this, NREL has taken several steps toward establishing a first-class computational capability. First came its Computational Sciences Initiative, adopted in 2000. It is a Lab-wide commitment to establish appropriate levels of computing power, data storage, applications software, and skilled support to all centers in the Laboratory. Next was the creation of the Computational Science Center. Situated in Building 16 in Golden, Colorado, the center has five staff members. Its director is Steve Hammond, who joined NREL in March 2002.

Shortly thereafter came the installation of a supercomputer: a 64 processor IBM SP parallel computer with 64 gigabytes of total memory and a peak speed of 96 billion floating point operations per second (gigaflops). The system is similar in character to machines at Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and Lawrence Berkeley National Laboratory's National Energy Research Scientific Computing Center.

Equipment such as this is essential to many NREL scientists, says Hammond. "It enables them to study complex systems and natural phenomena in a virtual environment that would otherwise be too expensive or dangerous, or even impossible, to study by direct experimentation." Scientists from NREL's Basic Sciences Center, for example, use the IBM system to simulate and model the electronic structure of materials for PV devices and hydrogen storage.

Hammond came to NREL from the National Center for Atmospheric Research in Boulder, Colorado, where he managed the Computational Sciences Section and led a number of R&D efforts to improve the computational efficiency of climate models. He holds a Ph.D. in Computer Science from Rensselaer Polytechnic Institute in Troy, New York, and master and undergraduate degrees from the University of Rochester.